



Fermilab

January 10, 2002

To: Bill Foster and Weiren Chou

From: Mike Witherell

SUBJECT: DESIGN STUDY OF PROTON DRIVER OPTIONS FOR THE MAIN INJECTOR

The HEPAP Subpanel report is expected to identify a modest energy, high average power, proton facility as a possible candidate for a construction project in the U.S. starting in the middle of the current decade. Fermilab represents an attractive location for such a facility and we need to identify options that could be presented to the DOE and U.S. community over the next few years if the physics is determined to warrant construction. One such option has been identified, the 8-16 GeV Proton Driver described in Fermilab-TM-2136, and another concept has recently come to light, an 8 GeV superconducting linac.

I would like the two of you to prepare a common document that would outline the two possible approaches to a Proton Driver at Fermilab and required modifications to the Main Injector to accommodate the increased intensity. In both cases I would like you to work with the following parameters:

Peak (Kinetic) Energy	8 GeV
Protons per Main Injector acceleration cycle	1.5×10^{14} (=1.9 MW @ 0.67 Hz)
Protons per second at 8 GeV	3.0×10^{14} (=380 KW)

For each option the report should include a description of the design concept and the technical components, identification of possible siting within Fermilab, and a preliminary cost estimate. In addition I would like you to provide a description and cost estimate for upgrades to the Main Injector, including its existing beamlines, and to the MiniBoone beamline required to support the performance defined above.

To the extent that you have the time and ability to do so I would like you to identify options for subsequent upgrades that could provide enhanced capabilities further into the future, including:

- Higher beam power at 8 GeV
- Higher beam power at 120 GeV, specifically through the implementation of reduced cycle time in the Main Injector
- An accumulator or compressor ring that could be used to achieve the performance required of the driver for a Neutrino Factory
- Utilization of the linac-based facility as an 8 GeV electron source

In general I would like to see each of these two options brought to a comparable state of development in this report. Because of the significant prior effort expended in the synchrotron-based proton driver, I expect that the development of the linac-based proton driver concept will require the bulk of the effort. Steve Holmes will provide Directorate guidance and support on this, including defining primary reference design parameters.

I would like to receive an interim report on progress prior to the ICFA Workshop at Fermilab on April 8-12 and a final report by May 15, 2002. Preparation of this report will require support of personnel in both the Beams and Technical Division. You should identify required resources and then work with the Divisions/Sections to secure support, consistent to their commitments to Run II. Both the Division/Section heads and Steve Holmes can help you in this task.

The identification of promising ventures utilizing hadrons and building upon Fermilab infrastructure and expertise is an important part of planning for the future of U.S. HEP. A Proton Driver could represent a strong candidate for a construction project in the intermediate term future with strong potential links to the longer-term future. Both Steve and I look forward to working closely with you and the participating divisions in defining the possibilities.

cc

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